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Diagnostic characters and geographic distribution of *Alepidea* species used in traditional medicine

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Species of *Alepidea* F. Delaroche (Apiaceae) are utilized as a source of medicine and food by various ethnic groups in South Africa. Data pertaining to the identity and commercial significance of different species is fragmentary and incomplete. Field work, herbarium studies and a literature survey have shown that at least six species are utilized for medicinal purposes: *A. amatymbica* Eckl. & Zeyh., *A. comosa* Dümmer, *A. longifolia* Dümmer, *A. macowanii* Dümmer, *A. pilifera* Weimarck and *A. setifera* N.E. Br. Only *A. amatymbica* is exploited commercially. Diagnostic characters are discussed and illustrated and distribution maps are provided. The demand for rhizomes and roots of *Alepidea* species (especially the dried rhizomes of *A. amatymbica*), together with habitat degradation and destruction, could threaten the sustainability of this medicinal plant resource.

Spesies van *Alepidea* F. Delaroche (Apiaceae) word deur verskeie etniese groepe in Suid-Afrika benut as 'n bron van medisyne en voedsel. Data oor die identiteit en kommersiële belang van verskillende spesies is gebrekkig en onvolledig. Veldwerk, herbariumstudies en 'n literatuurstudie het aangetoon dat minstens ses spesies benut word vir medisinale doeleindes: *A. amatymbica* Eckl. & Zeyh., *A. comosa* Dümmer, *A. longifolia* Dümmer, *A. macowanii* Dümmer, *A. pilifera* Weimarck en *A. setifera* N.E. Br. Slegs *A. amatymbica* word kommersieel benut. Diagnostiese kenmerke word bespreek en geïllustreer, en verspreidingskaarte word verskaf. Die aanvraag na wortelstokke en wortels van *Alepidea* spesies (veral gedroogde wortelstokke van *A. amatymbica*), tesame met agteruitgang en vernietiging van die habitat, kan 'n bedreiging inhou vir die hernubaarheid van hierdie medisinale planthulpbron.

Keywords: *Alepidea*, Apiaceae, geographical distribution, identification, ethnobotany.

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Introduction

The genus *Alepidea* F. Delaroche is restricted to the African continent, with approximately 28 species in southern Africa (Burtt 1991) and two species in North-East Africa. According to Drude's (1898) classification system for the Apiaceae, *Alepidea* is placed in the subfamily Saniculoideae, together with the predominantly north-temperate genera *Eryngium* L. and *Sanicula* L., both of which contain plants of well-known medicinal value (Watt & Breyer-Brandwijk 1962; Stuart 1979). The vital importance of medicinal plants in health care is reflected by the fact that up to 80% of the world's people depend on traditional medicine (mostly plant extracts or their active principles) for their primary health care needs (according to the World Health Organization 1993).

Watt and Breyer-Brandwijk (1962) listed four species of *Alepidea* that are utilized for medicinal purposes, namely *A. amatymbica* Eckl. & Zeyh., *A. ciliaris* F. Delaroche, *A. longifolia* [E. Mey. ex) Dümmer and *A. setifera* N.E. Br. Plants referred to as *A. ciliaris* are now known as *A. pilifera* Weimarck (see below). The rhizomes and roots of all these species are either chewed or used in the preparation of an infusion as a remedy for coughs and chest complaints. *A. amatymbica* (well-known by the Zulu name 'ikathazu') is the most widely utilized species, and is used by the Zulu, the Swazi, the Southern Sotho and the Xhosa (Watt & Breyer-Brandwijk 1962; Hutchings 1989a). In addition to the above-mentioned uses, *A. amatymbica* is also used as a purgative and as a remedy for colds, abdominal disorders and rheumatism (Watt & Breyer-Brandwijk 1962). The leaves of both *A. longifolia* and *A. natalensis* Wood & Evans are used as a vegetable, and are known as 'ikhokwana' by the Zulu (Dümmer 1913; Fox & Norwood Young 1988).

The taxonomy of *Alepidea* is in a very unsatisfactory state and the species are often wrongly identified. Basic taxonomic information is clearly needed as a first step towards more detailed ethnobotanical surveys. This study was undertaken to record the identity and geographical distribution of all the species known to be used for medicinal purposes and to provide a means of identifying them.

Materials and Methods

Variation in morphological characters, the identity of voucher specimens and accurate locality data of *Alepidea* species were recorded in the following herbaria: GRA, J, NH, NU, PRE and UFH. Field work was carried out in eastern Zimbabwe, south-eastern Transvaal, Natal (mainly the Durban area and along the Drakensberg), the north-eastern Orange Free State and the eastern Cape. With the help of Mr G. Nichols (conservation officer of the Durban Municipality), several people involved in the conservation, cultivation and retailing of *Alepidea* were interviewed. The surface sculpturing of air-dried fruits was studied with an ISI-SS60 scanning electron microscope at 10 kV, after the fruits had been coated with gold (Biorad SC500 sputter coater, 4.5 min). Photographs were taken with Ilford HP5 (400 ASA) film.

Results and Discussion

Five species of *Alepidea* (possibly six or seven, if *A. natalensis* and *A. comosa* are included) are now known to be utilized as medicinal plants. These species are readily identified by the shape of the radical (basal) leaves and by the setae and serrations of the leaf margins (Figure 1). The shape, size and surface sculpturing of fruits are also taxonomically useful (Figure 2). Diagnostic characters and known geographical distributions are described and illustrated below.

1. ***A. amatymbica*** Eckl. & Zeyh., Enumeratio plantarum Africae australis extratropicae: 339 (1837); Dümmer: 5 (1913); Weimarck: 219 (1949); Burtt: 164 (1991).

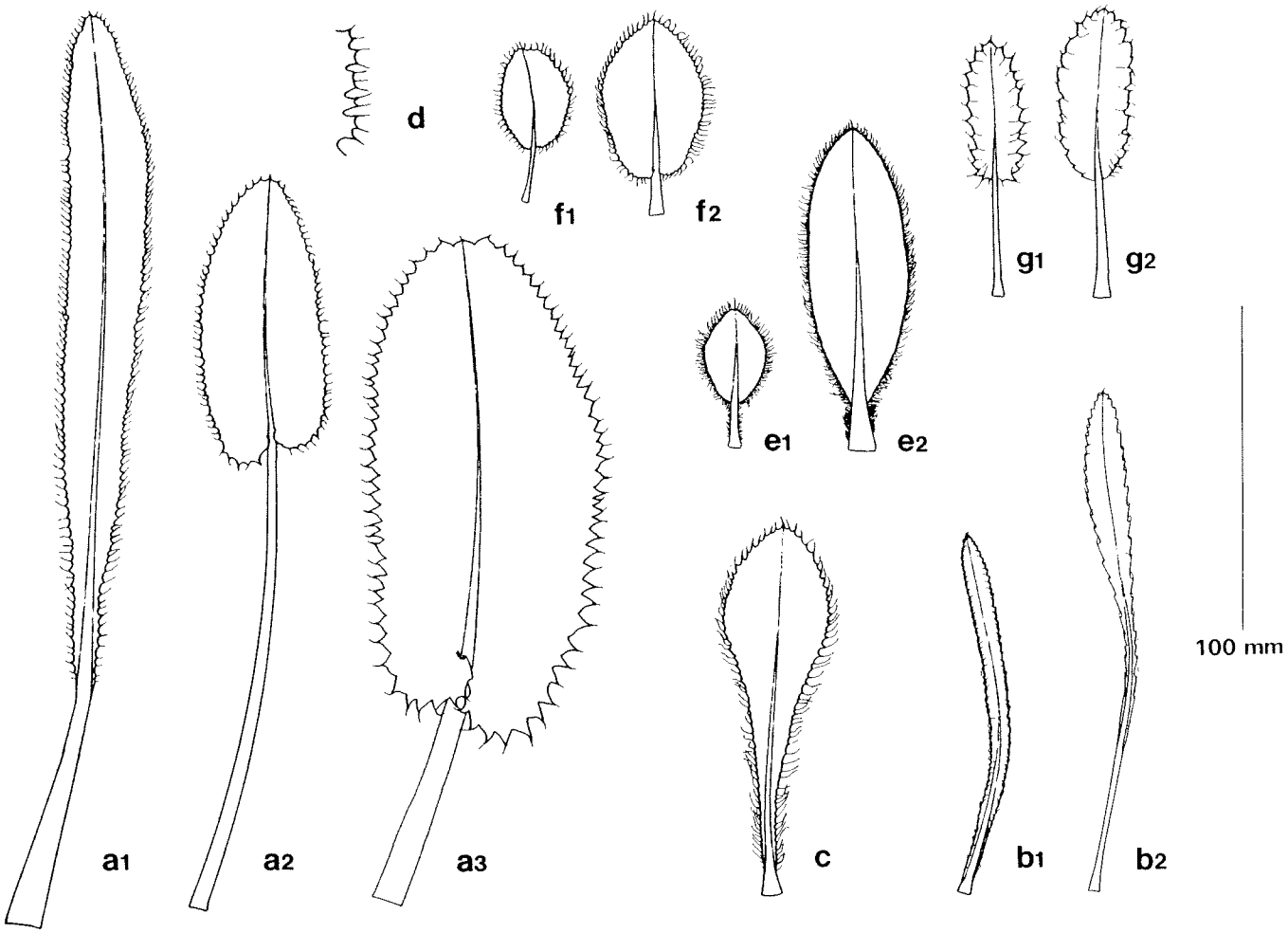

Figure 1 Variation in the radical leaves of some *Alepidea* species. **a**. *A. amatymbica*: a1, form with cuneate leaves [*Pegler 1670* (PRE) from Cala district, Transkei]; a2, form with cordate leaves [*Jacobsz 339* (PRE) from Harrismith district, eastern Orange Free State]; a3, form with cordate leaves [*de Castro 159* (JRAU) from Golden Gate, eastern Orange Free State]. **b**. *A. longifolia*: b1, *Acocks 11366* (PRE) from Estcourt, Natal; b2, *Obermeyer 287* (PRE) from Lydenburg, eastern Transvaal. **c**. *A. comosa* [*de Castro 178* (JRAU) from Drummond, Natal]. **d**. *A. macowanii* (part of leaf margin, showing a number of lobes or serrations, each of which is further divided into two or three teeth) [*Galpin 8357* (PRE) from Katberg, eastern Cape]. **e**. *A. natalensis*: e1, [*de Castro 186* (JRAU) from Howick, Natal]; e2, [*de Castro 209* (JRAU) from Giant's Castle, Natal]. **f**. *A. setifera*: f1 (*Hilliard & Burtt 14422* (PRE) from the Middelburg district, Transvaal]; f2, [*de Castro 142* (JRAU) from Golden Gate, eastern Orange Free State]. **g**. *A. pilifera*: g1, adaxial view of leaf [*Medley-Wood 10583* (PRE) from the Natal Drakensberg]; g2, adaxial view of leaf [*Dieterlen 411* (PRE) from the Leribi plateau in Lesotho].

Most robust of all *Alepidea* species; stem and peduncle hollow, up to 2 m high, rootstock rhizomatous, up to *ca.* 130 mm long and 30 mm in diameter (Figure 3). Radical leaves (Figure 1, a1–a3) up to 400 mm long and *ca.* 100 mm wide, petioles up to 200 mm long and 10 mm wide. The involucral segments in two distinct series, the outer series much longer than the inner series. Mericarps (Figure 2a) smooth on the dorsal surfaces, except for a few inconspicuous squamose protuberances just below the sepals (Burtt 1991). *A. amatymbica* is distinguished from the other two smooth-fruited species (*A. macowanii* and A. *multisecta* B.L. Burtt) by its regularly dentate leaf margin lacking any deeper incision.

A. amatymbica is widely distributed in southern Africa (Figure 4a) from the eastern Cape northwards to eastern Zimbabwe. It occurs at high altitudes (above 800 m) in moist areas such as stream banks and drainage zones on steep slopes, as well as on forest margins.

In addition to the geographically widespread *A. amatymbica* var. *amatymbica*, Weimarck (1949) recognized var. *aquatica* (O. Kuntze) Weimarck (recorded from the mountains of the Eastern Cape, between Somerset East and Cala) and var. *microbracteata* Weimarck (known only from the Umzinto region of southern Natal). The geographical distributions are not shown separately in Figure 4a. The var. *aquatica* is said by Weimarck to differ from the typical variety in its longer and narrower leaves (i.e. the extreme form illustrated in Figure 1, a1) which may be up to 400 mm long and 30–40 mm wide. The var. *microbracteata* is similar to Weimarck's typical *A. amatymbica* from northern localities (Figure 1, a2 & a3) in leaf shape, but it has much smaller involucral segments (about 5 mm long in var. *microbracteata* and about 10 mm long in var. *amatymbica*).

A. amatymbica is the only species which is traded commercially in Natal, and it is likely that this is also the case elsewhere in South Africa. In Natal, our field study showed that the average market value of the dried rhizome and roots is approximately R47 per kilogram (*ca.* 95c per rhizome), but the price varies greatly, from R23 to R73 per kilogram. The product (Figure 3) is a popular remedy for colds and chest complaints. The fresh roots are chewed (Hutchings 1989b) or the dry product is administered orally in the form of a decoction (according to four different street vendors), to which honey is usually added (Mr M. Cele, pers. commun. 1993). Some of the active components are likely

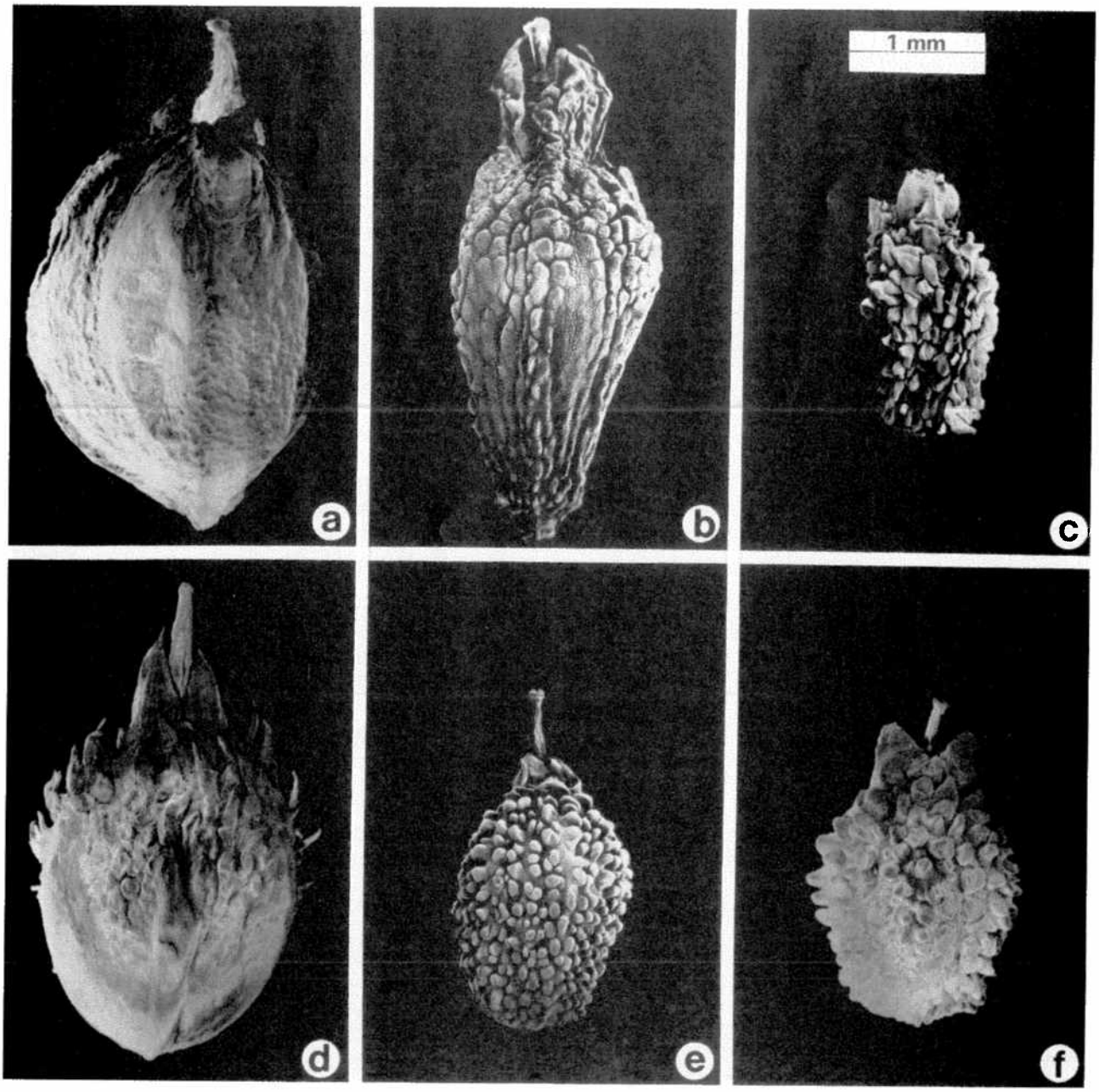

Figure 2 Variation in the shape, size and surface sculpturing of the mericarps of some *Alepidea* species, as seen in dorsal view. **a.** *A. amatymbica* [*de Castro 160* (JRAU)]. **b.** *A. comosa* [*Strey 9845* (PRE)]. **c.** *A. longifolia* [*Kidger s.n.* (J)]. **d.** *A. natalensis* [*Galleway 16* (NU)]. **e.** *A. pilifera* [Phillipson 1374 (PRE)]. **f.** *A. setifera* [*de Castro 142* (JRAU)].

to be diterpenoids. Rustaiyan and Sadjadi (1987) have isolated several kaurene derivatives from the roots and aerial parts of *A. amatymbica*. We could find no published information on the chemistry or pharmacology of the active principles in *Alepidea*, but screening tests by a pharmaceutical company indicated antihypertensive, antimicrobial and diuretic properties (Hutchings 1989b).

2. *A. comosa* Dümmer in *Transactions of the Royal Society of South Africa* 3: 16 (1913); Burtt: 166 (1991).

Plants 250–600 mm high, often with a well-developed rhizomatous rootstock up to 40 mm long and 10 mm in diameter. Radical leaves broadly oblanceolate to spatulate; erect and coriaceous, with coarse, forward-pointing marginal setae (Figure 1, c). Petioles and basal part of stem often bright purple, and stem base angular in transverse section. Fruit are narrowly obovate with squamose outgrowths in longitudinal lines and at the apex (Figure 2b).

This taxon is closely related to *A. longifolia*, but can be distinguished by the coriaceous leaves, the coarse forward-pointing marginal setae and the narrower, less densely ornamented fruit. It occurs in grassland, often in seepage zones and other moist areas and is widely distributed in the Transkei, the coastal and midland areas of Natal, and in the south-eastern and central regions of the Transvaal, at altitudes below 1800 m (Figure 4b).

3. *A. longifolia* [E. Mey. ex] Dümmer in *Transactions of the Royal Society of South Africa* 3: 8 (1913); Burtt: 295 (1982); Burtt: 167 (1991).

Plants 200–700 mm high. Radical leaves usually long, oblanceo-

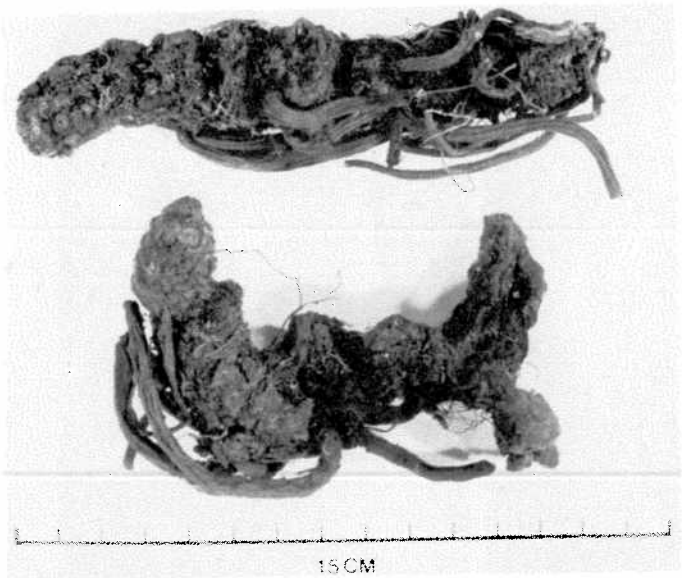

Figure 3 Dried rhizomes of *Alepidea amatymbica*, as sold by street vendors and herbalists under the Zulu name 'ikathazu'.

late to linear-oblanceolate, with the base narrowly tapering (Figure 1, b1 & b2). Margin obscurely crenate-serrate. Seta (fine hair) on tip of each serration more or less inflexed (and thus situated above the adaxial surface of the lamina). Mericarps (based on limited, immature material) with dense, evenly distributed squamose outgrowths (Figure 2c).

In southern Africa, this species (in its current concept) occurs in grassland in the Drakensberg region, from the eastern Transvaal to Natal (Figure 4c), at altitudes of 1000–2800 m.

A. longifolia is part of an exceptionally variable species complex, which includes the previous species (*A. comosa*) and also the east and north African *A. peduncularis* A. Rich. The exact delimitation of these species is not clear and only the extreme forms (as depicted in Figure 1, b & c) can be readily distinguished. The fruits of *A. longifolia* (Figure 2c, slightly immature) differ considerably in shape and in surface ornamentation from those of *A. comosa* (Figure 2b). Fruiting material is rarely collected and further field work is needed to study the full range of variation and the delimitation of *A. comosa* and *A. longifolia*.

A. longifolia was reported as a medicinal plant by Watt and Breyer-Brandwijk (1962), and the species is also used as a vegetable ('ikhokwana') in Zululand and Swaziland (Fox & Norwood Young 1988). Reports citing *A. longifolia* could also refer to *A. comosa*, since the latter was previously regarded as a subspecies of *A. longifolia*.

4. *A. macowanii* Dümmer in *Transactions of the Royal Society of South Africa* 3: 6 (1913); Weimarck: 219 (1949); Burtt: 168 (1991).

Robust plant up to 1 m high, with a well-developed rhizomatous rootstock. Leaves similar to those of *A. amatymbica*, but distinguished by their lobed and dentate margins (Figure 1, d). Involucral segments less subequal than in *A. amatymbica* (but the double toothing of the leaf margin is a better diagnostic character). The mericarps were reported to be smooth on the dorsal surface (Weimarck 1949), but we have been unable to find any fruit for study.

A. macowanii occurs in moist grassland in the mountains of the eastern Cape between Somerset East and Stutterheim (Figure 4d).

Apart from *A. macowanii* and *A. amatymbica*, the only other *Alepidea* with smooth fruit is *A. multisecta* B.L. Burtt, a rare species from Gaika's Kop in the eastern Cape. It is unlikely to be confused with the other smooth-fruited species, because it has the radical leaves digitately divided into five segments.

According to herbarium records, the roots of *A. macowanii* are used medicinally in the eastern Cape.

5. *A. natalensis* Wood & Evans in *Journal of Botany* 37: 255 (1899); Dümmer: 18 (1913); Burtt: 296 (1982).

Plants 200–500 mm high, with radical leaves in a flat rosette. Radical leaves elliptic to elliptic-orbicular and often coriaceous, with dense marginal setae interspersed with smaller setae of varying length (Figure 1, e1 & e2). Petioles with conspicuous setae on margin. Involucral bracts 10, obtuse to rounded, in two distinct series (smaller bracts often completely absent, leaving just the five large bracts). Mericarps with long, narrow squamose protuberances restricted to the upper half of the fruit (Figure 2d).

A. natalensis is found amongst rocks on grassland slopes in the Drakensberg, mostly at altitudes of 1200–2300 m. The known range extends from the Cala region of the Transkei in the south, to the Harrismith area of the Orange Free State in the north (Figure 4d).

This species is used as a vegetable – 'ikhokwana' – by the Zulu (Dümmer 1913, Fox & Norwood Young 1988). G. Nichols (pers. commun. 1993) recorded the utilization of this species, but the purpose for which the plants were harvested was not clear.

6. *A. pilifera* Weimarck in *Botaniska Notiser* 1949: 257, tab. 5.; Burtt.: 170 (1991).

Plants 200–600 mm high. Radical leaves oblong to orbicular, with a cordate to rounded base (Figure 1, g1 & g2). Underside of the leaf pale grey-green, with the veins which give rise to marginal cilia visibly raised and thickened at the tip of each dentation. Fruits relatively small and entirely covered with rounded outgrowths (Figure 2e).

A. pilifera is distinguished from the closely related *A. capensis* (Berg.) R.A. Dyer by the presence of interdentine cilia. In *A. capensis*, cilia are found on the tips of the serrations only; interdentine cilia are absent. *A. pilifera* occurs in the Maluti mountains of Lesotho and in the Natal Drakensberg, at altitudes ranging from *ca.* 1700 to 2700 m (Figure 4e).

Watt and Breyer-Brandwijk (1962) referred to Phillips (1917), who recorded *A. ciliaris* F. Delaroche as a medicinal plant in Lesotho, where it is used as a remedy for chest complaints. The correct name for the cited specimen (*Dieterlen 411*, PRE) is now *A. pilifera*, according to the nomenclature of Burtt (1991).

7. *A. setifera* N.E. Br. in *Kew Bulletin* 1896: 161 (1896); Dümmer: 7 (1913); Weimarck: 247 (1949); Burtt: 171 (1991).

Plants 300–600 mm high; stem and peduncle densely covered for their whole length with lanceolate cauline leaves and bracts. Radical leaves broadly elliptic to obovate-orbicular, with an obtuse to rounded apex and a cordate base (Figure 1, f1 & f2). The dorsal surfaces of the mericarps are completely covered with squamose outgrowths (Figure 2f).

A. setifera grows in mountain grassland, often on dry slopes. The known geographical distribution includes the Natal Drakensberg, the north-eastern Orange Free State, the eastern Transvaal and the Transvaal Highveld (Figure 4f).

A. basinuda Pott and *A. reticulata* Weimarck are very similar to *A. setifera* and a detailed study may well prove them to be the same species. *A. basinuda* differs only in the naked stem base

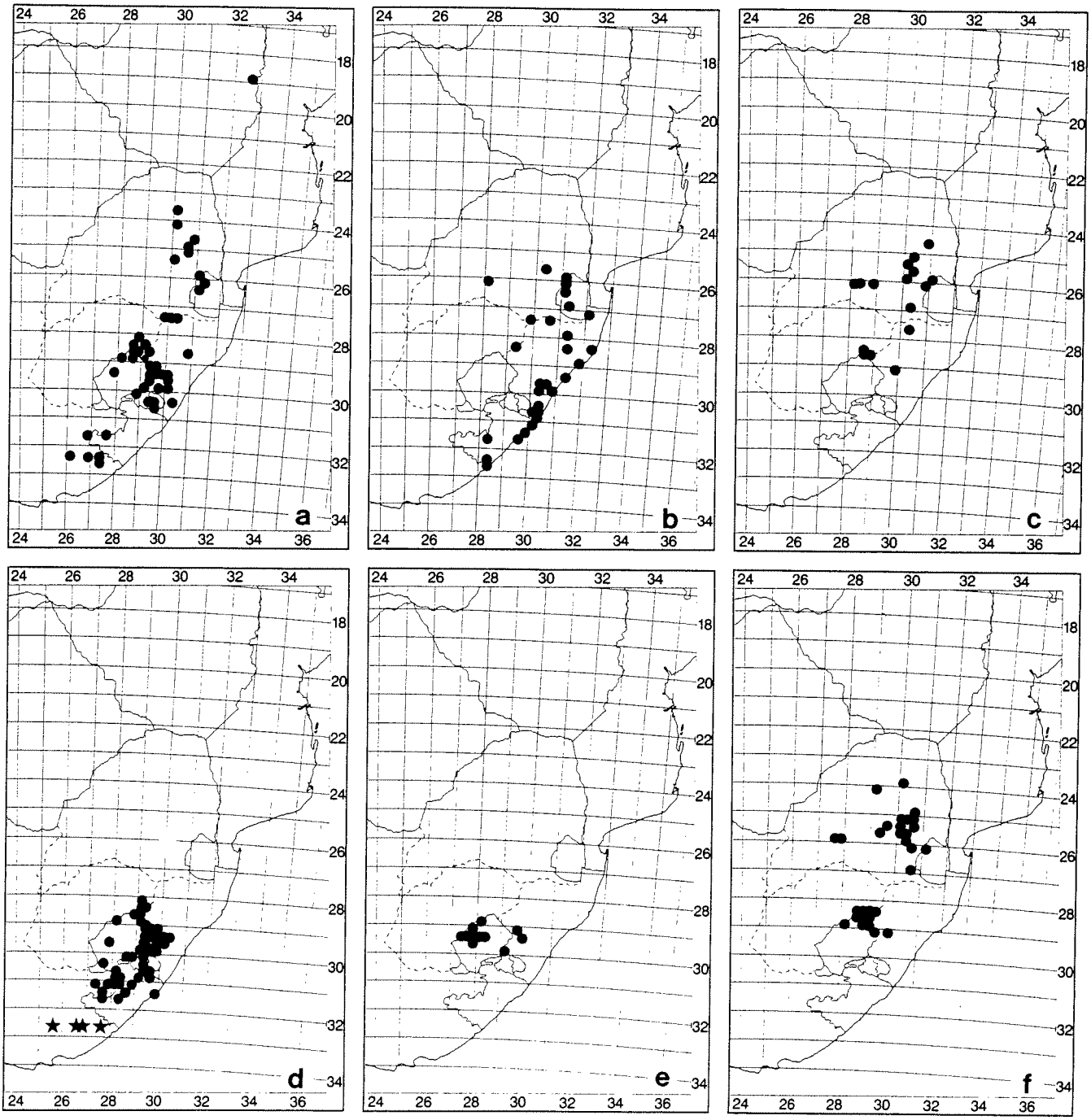

Figure 4 The known geographical distribution of *A. amatymbica* (a), *A. comosa* (b), *A. longifolia* (c), *A. macowanii* (d, ★), *A. natalensis* (d, ●), *A. pilifera* (e) and *A. setifera* (f).

(stem base leafy in *A. setifera*) and in the more sparsely distributed cauline leaves. *A. reticulata* Weimarck is said to differ in its 'less ramified, apical inflorescence and broader, foliaceous, reticulately veined involucral segments' (Weimarck 1949). Many intermediates may be found between these three species.

Conclusions

Five species of *Alepidea* could be positively identified as medicinal plants, and of these only *A. amatymbica* is traded commercially. The results obtained in this study suggest that most of the species may occasionally be utilized but that the preference depends on the size of the plants and their availability. The dried rhizomes of *A. amatymbica* are a popular remedy for colds and chest complaints among the Zulu and other ethnic groups, and they are readily available from street vendors and herbalists. Since the whole plant is removed, this popularity could easily lead to the denudation of natural populations in unprotected areas. There are, however, many conservation areas within the known distribution range of *A. amatymbica* where large numbers of the plants still occur, and these protected populations constitute a valuable genetic resource. Species which have limited distribution areas, such as *A. macowanii*, may be vulnerable to overexploitation.

Acknowledgements

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